

ECONOMIC VALUES AND ECONOMIC IMPACTS ASSOCIATED WITH CONSUMPTIVE USES OF MAINE'S FISH AND WILDLIFE RESOURCES

by

Kevin J. Boyle Marcia L. Phillips Stephen D. Reiling and Lawrence K. Demirelli *

DECEMBER 16, 1988

Interim Report No. 1 to the Maine Legislative Commission to Study the Impact of Game and Nongame Species on Maine's Economy.

* The authors are, respectively, Assistant Professor, Research Associate, Associate Professor, and Research Associate in the Department of Agricultural and Resource Economics at the University of Maine.

ł i. ÷ ł

EXECUTIVE SUMMARY

This interim report presents results from surveys of licensed anglers, hunters and trappers in Maine during 1987. The primary purpose of these surveys was to collect data on total economic values, surplus values and economic impacts. These terms are defined as follows:

* Total economic value is the maximum dollar amount an individual would pay rather than forgo the opportunity to participate in an activity such as fishing, hunting or trapping.

* <u>Economic</u> <u>impact</u> is measured by the costs incurred to participate in an activity such as fishing, hunting or trapping.

* <u>Surplus value</u> is total economic value minus economic impacts.

See the second section of the text for further explanation of these terms. Key research findings are as follows:

Fishing in Maine During 1987

- Estimated aggregate surplus value is \$74.6 million, \$60.8 million attributable to resident anglers and \$13.8 million attributable to nonresident anglers.
- 2a. The <u>minimum</u> estimate of the aggregate economic impact is \$156.4 million, \$112 million attributable to resident anglers and \$44.4 million attributable to nonresident anglers.
- b. The <u>maximum</u> estimate of the aggregate economic impact is \$359.5 million, \$276.2 million attributable to resident anglers and \$83.3 million attributable to nonresident anglers.
- 3a. The <u>minimum</u> estimate of aggregate total economic value is \$231 million, \$172.8 attributable to resident anglers and \$58.2 million attributable to nonresident anglers.
- b. The <u>maximum</u> estimate of aggregate total economic value is \$434.1 million, \$337 million attributable to resident anglers and \$97.1 million attributable to nonresident anglers.

Hunting in Maine During 1987

- Estimated surplus value is \$27.5 million, with \$22.1 million attributable to resident hunters and \$5.4 million to nonresident hunters.
- 2a. The <u>minimum</u> estimate of the aggregate economic impact is \$85.4 million, with \$63.7 million attributable to resident hunters and \$21.7 million to nonresident hunters.
- b. The <u>maximum</u> estimate of the aggregate economic impact is \$176.1 million, with \$137.4 million attributable to resident hunters and \$38.7 million to nonresident hunters.
- 3a. The <u>minimum</u> estimate of aggregate total economic value is \$112.9 million, with \$85.8 million attributable to resident hunters and \$27.1 million to nonresident hunters.
- b. The maximum estimate of aggregate total economic value is \$203.6 million, with \$159.5 million attributable to resident hunters and \$44.1 million to nonresident hunters.

Trapping in Maine During 1987

- 1. A surplus value was not estimated.
- 2a. The <u>minimum</u> economic impact is \$1.4 million. (Sample only includes residents.)
- b. The maximum economic impact is \$3.2 million.
- 3. Since a surplus value was not estimated, the economic impacts constitute minimum estimates of aggregate total economic value.

Fishing, Hunting and Trapping Results Combined

- Estimated aggregate surplus value is \$102.1 million, with \$82.9 million attributable to residents and \$19.2 million to nonresidents.
- 2a. The <u>minimum</u> estimate of the aggregate economic impact is \$243.2 million, with \$177.1 attributable to residents and \$66.1 million to nonresidents.
- b. The <u>maximum</u> estimate of the aggregate economic impact is \$538.8 million, with \$416.8 million attributable to residents and \$122 million to nonresidents.
- 3a. The <u>minimum</u> estimate of the aggregate total economic value is \$345.3 million, with \$260 million attributable to residents and \$85.3 million to nonresidents.
- b. The <u>maximum</u> estimate of the aggregate total economic value is \$640.9 million, with \$499.7 million attributable to residents and \$141.2 million to nonresidents.

Interpretation

Minimum and maximum economic impacts and total economic values are reported since one of the expenditures categories that comprise economic impacts is overstated. These expenditures on items used for fishing, hunting and/or trapping at certain times of the year, and that are also used for other purposes at other times. Thus, economic impacts excluding these expenditures (minimums) and economic impacts including these expenditures (maximums) are reported. These minimum and maximum economic impacts lead to the minimum and maximum estimates of total economic values. Surplus value is added to the corresponding economic impact to derive a total economic value.

Finally, total economic values represent the total value of fishing, hunting and trapping opportunities in Maine. For public policy analyses, however, surplus values and economic impacts, the components of total economic values, are the important concepts. When considering the effects of fish and wildlife management on Maine's economy, economic impacts are generally the relevant piece of information. Economic impacts are the means by which communities, their citizens and the State's economy benefit from fishing, hunting and trapping. Anglers, hunters and trappers also directly benefit from participating in these activities and their gain is measured as surplus value. Thus, when considering the effects of resource management decisions on anglers, hunters and trappers, surplus values are relevant.

CAUTIONS

- 1. The surplus values are minimum estimates since surplus values are not estimated for marine sport fishing, moose and turkey hunting, and trapping.
- 2. The minimum aggregate economic impact is a reasonable estimate of the minimum. However, we believe that the maximum estimate of aggregate economic impact is probably an overstatement of the true economic impact. Therefore, extreme caution should be used when using this maximum estimate.
- 3. Given what we said for (1) and (2) above, the minimum estimate of total economic value for consumptive uses of Maine's fish and wildlife resources should exceed the minimum estimate of \$345.3 million, but will not exceed the maximum estimate of \$640.9 million.
- 4. Economic values and economic impacts for nonconsumptive uses of Maine's fish and wildlife resources are not reported. These numbers will be reported at the end of the second year of the study.
- 5. Economic multipliers are often applied to expenditure data to account for the effect of money being respent in an economy. The expenditures reported here are direct economic impacts and do not include multiplier calculations to account for the respending effect. If multipliers are applied to our numbers, they should only be applied to the economic impacts and not to the surplus values.

iv

v

TABLE OF CONTENTS

															•										Ŧ	PAGE
EXECU	TIVE	SUMM	IARY	Ζ.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	i
TABLE	OF C	ONTE	NTS	5.	•	•	•	•	•	•	•	•	•	•	•	٠	•	•	•	•	• .	•	•	•	•	v
LIST (OF TA	BLES	•	•	•	•	•	•	•	•	•	٠	•	•	•	٠	•	•	•	•	•	۰	•	۰	•	vi
INTRO	DUCTI	ON.	•	•	•	•	•	•	•	•	•	•	•	•	•	۰	•	•	•	٠	•	•	•	•	•	1
ECONO	MIC V	ALUE	s A	ND	E	CO	NO	MI	С	IM	IPA	CI	'S	DE	FI	NE	D	۰	•	•	•	•	•	•	•	3
SPORT	FISH Selec Surpl Econo Aggre	ING. ted us V mic gate	Ang alu Imp An	, les pac	r f ts er	Ch or o S	ar S f ur	el Sp pl	te ec or us	ri te t	.st d Fi al	ic Ty .sh .ue	s pe in s	s ig an	of id	S EC		ort	F	is I	mp	.ng .ng		•	•	6 7 10 12 16
HUNTII S I J	NG Selec Surpl Econo Aggre	ted us V mic gate	Hur alu Imp Hu	ite les bac	f ts er	Ch or o S	S f ur	el Hu pl	te ec nt	ri te in V	.st d g al	ic Ty .ue	:s pe	es an	of d	Н Ес		iti iom	.ng		mp		ts	•	• • • •	20 21 22 25 28
TRAPP	ING . Selec Surpl Econo Aggre	ted us V mic gate	Tra alu Imp Tr	ipp les bac	er f ts pi	°C or og	ha T f E	ra ra Tr co	ct pp ap no	er oin opi	is g ng c	ti In	.cs .pa		•	• • • • • • • • • • • • • • • • • • • •	• • • •	0 0 0	• • •	• • •	• • • •	• • •	• • •	•	• • •	31 32 34 34 37
AGGRE	GATE IMPAC	SURP TS F	LUS OR	S V FI	AL SH	UE: IN(s G,	AN H	D UN	EC TI	ON NG	IOM F A	II C NE	:) I	RA	PP	PIN	ſG	со	ME	SIN	IED)。	0	0	38

.

LIST OF TABLES

TABLE	<u>3</u>	PAGE
1	Characteristics of Maine Licensed Anglers During 1987	. 9
2	Surplus Values for Selected Types of Sport Fishing in Maine During 1987	. 10
3	Trip Specific Expenditures in Maine for All Fishing Trips During 1987	. 13
4	Fishing Equipment Purchased in Maine During 1987	. 14
5	Equipment Purchased in Maine During 1987 Used for Fishing and <u>Other</u> Activities	. 15
6	Aggregate Surplus Values, Economic Impacts and Total Economic Values for Fishing in Maine During 1987	. 17
7	Characteristics of Maine Licensed Hunters During 1987	. 21
8	Surplus Values for Selected Types of Hunting in Maine During 1987	. 23
9	Trip Specific Expenditures in Maine for all Hunting Trips During 1987	。26
10	Hunting Equipment Purchased in Maine During 1987	。27
11	Equipment Purchased in Maine During 1987 Used for Hunting and <u>Other</u> Activities	. 28
12	Aggregate Surplus Values, Economic Impacts and Total Economic Values for Hunting in Maine During 1987	. 29
13	Characteristics of Maine Licensed Trappers During 1987	. 33
14	Trip Specific Expenditures in Maine for All Trapping During 1987	. 35
15	Trapping Equipment Purchased in Maine During 1987	. 36

νi

- 16 Equipment Purchased in Maine During 1987 Used for Trapping and <u>Other</u> Activities . . 37

. .

INTRODUCTION

In January 1988 the Commission to Study the Impact of Game and Nongame Species on Maine's Economy contracted with the Department of Agricultural and Resource Economics at the University of Maine to conduct an economic evaluation of recreational uses of Maine's fish and wildlife resources. This interim report, at the end of the first year, presents overall evaluations of consumptive uses of fish and wildlife (fishing, hunting and trapping). Specifically, economic values and economic impacts are reported for each type of consumptive use. Nonconsumptive uses will be reported at the end of the second year of the study.

To obtain the data required for the analyses, individuals (both residents and nonresidents) holding either a 1987 Maine fishing, hunting or trapping license were sampled via a mail survey; one survey was conducted for each type of consumptive The angler and hunter surveys served two primary purposes. use. First, the overall surveys were used to identify anglers and hunters who will receive detailed surveys, in the second year of the study, on specific types of fishing and hunting, respectively. A fishing or hunting license entitles the holder to participate in a variety of fishing or hunting activities, but the fact that an individual holds a license does nothing to reveal the specific activities in which the angler or hunter participates. For example, does an angler pond/lake fish or stream/river fish? Or, does a hunter go bear hunting or deer hunting? These types of questions can only be answered by

directly asking anglers and hunters. Once these questions are answered, detailed surveys can be administered for specific types of fishing and hunting. The overall surveys of fishing and hunting served this purpose. In the next phase of the project, open water fishing, ice fishing and marine fishing surveys will be administered to sport anglers. Hunters will be surveyed regarding bear, deer, moose, migratory waterfowl, turkey and upland game bird hunting.

The second purpose, which is the focus of this report, was to determine the economic value and economic impact of fishing and hunting in Maine.

The focus of the trapping survey was slightly different. Information on various types of trapping, and species sought, could be conveniently collected in a single survey. Follow-up surveys on specific types of trapping are not needed. The trapper survey focuses on collecting information needed by the Department of Inland Fisheries and Wildlife for management analyses and obtaining the needed economic data.¹ The management data will be presented in early 1989 in a report dealing solely with trapping in Maine.

Within the current interim report, economic impacts are

A survey of trappers was conducted by the Maine Department of Inland Fisheries and Wildlife in 1980 (Clark, 1985). The limitation of this prior survey for the present study is the omission of questions designed to collect economic data. (Clark, Alan. 1985. "Characteristics of Trappers in Maine, 1976 to 1980." Unpublished M.S. Thesis, Virginia Polytechnic Institute and State University.)

reported. Economic values for trapping are not reported since some individuals trap for recreation, while others trap commercially.

Thus, the focus of the current report is on economic values and economic impacts associated with consumptive uses of Maine's fish and wildlife resources. The organization of the report is as follows. Economic terminology used in this report is defined in the next section. Empirical results for fishing, hunting and trapping, respectively, are reported in the subsequent sections. The final section contains aggregate results across all three categories of consumptive use.

ECONOMIC VALUES AND ECONOMIC IMPACTS DEFINED

To an economist, economic values and economic impacts are related but distinct concepts. These concepts will be defined to facilitate discussion in the remainder of this report.

Total economic values for recreational fishing, hunting and trapping are defined in terms of the individuals who participate in these activities. <u>Total economic value</u> is defined as the maximum an individual would pay rather than forgo the opportunity to participate in an activity. That is, if the maximum an individual would pay for a deer hunting trip is \$100, he/she would go deer hunting as long as the cost of a trip does not exceed \$100. <u>Aggregate</u> total economic values are derived by adding the total economic values of all participants in an activity. Assume, for simplicity, that only four deer hunters exist in the world and each takes only one deer hunting trip per

year. The respective total economic values they place on a deer hunting trip are \$50, \$75, \$100 and \$25. The aggregate total economic value of deer hunting is \$250 per year (\$50 + \$75 + \$100 + \$25).

A portion of an individual's total economic value for any activity is dissipated as money is spent to participate in the activity. These expenses represent the cost of participation. Returning to our single deer hunter example, suppose a trip costs \$30. The hunter receives a net total economic value of \$70 (\$100 - \$30). We will refer to net total economic values as <u>surplus</u> <u>values</u>, total economic value in excess of costs. All other factors being equal, the larger the surplus value associated with an activity, the more desirable it is to current and future participants.

Recreational expenditures constitute <u>economic impacts</u>. In the deer hunting example, the economic impact of the hunter's participation is \$30, the cost of participating. A word of caution is necessary. From the accounting framework used in this report, only expenditures made within Maine are counted as economic impacts. We will not concern ourselves with expenditures made by nonresidents outside of Maine, e.g., travel expenses incurred in their home states. Nor will expenditures made by residents outside of Maine be considered, e.g., purchases of fishing or hunting equipment from mail order firms located in other states.

The justification for including only purchases made within Maine is that these expenditures (economic impacts) are the means by which local communities, their citizens and the State's economy benefit from fishing, hunting and trapping. Maine residents are affected by angler, hunter and trapper expenditures since these expenditures generate economic activity, employment and income within Maine. Anglers, hunters and trappers also directly benefit from participating in these activities and their gain is measured as surplus value. Fishing, hunting and trapping opportunities with the largest aggregate expenditures within Maine will generate the largest economic impacts. Expenditures made outside of Maine will not generate these effects. The desire, therefore, is to measure the effect of fish and wildlife related activities on Maine's economy.

Before leaving this subject let us briefly consider <u>aggregate</u> surplus values and economic impacts. Recall our simplified world of four deer hunters with total economic values of \$50, \$75, \$100 and \$25 per trip. The aggregate total economic value is \$250. Suppose the hunters incur per trip expenditures of \$25, \$50, \$30 and \$15, respectively. Surplus values for the four hunters, respectively, are \$25 (\$50 - \$25), \$25 (\$75 - \$50), \$70 (\$100 - \$30) and \$10 (\$25 - \$15). Aggregate surplus value is \$130 (\$25 + \$25 + \$70 + \$10) and the aggregate economic impact is \$120 (\$25 + \$50 + \$30 + \$15). Thus, aggregate total economic value equals aggregate surplus value plus the aggregate economic impact (\$250 = \$130 + \$120). This is the relationship between

economic values and economic impacts that will be dealt with in this report. Economic values are surplus values and economic impacts are expenditures.²

The deer hunting example assumes that all expenditures are made within Maine. In reality, this is not true since resident and nonresident anglers, hunters and trappers also spend money outside of Maine. The expenditures reported below will include only those that are made in Maine.

The next three sections report empirical results for anglers, hunters and trappers, respectively. These sections are organized as follows. Selected socioeconomic and activity specific characteristics are reported first. Then, for anglers and hunters, surplus values per participant are presented. Subsequently, economic impacts per participant are presented for each of the three types of consumptive use. Finally, aggregate numbers are reported for each activity.

SPORT FISHING

The sample of sport anglers was randomly selected from a subset of all individuals holding a 1987 Maine fishing license. Juveniles (nonresident anglers ages 12 to 15) holding a Maine fishing license and aliens (non-U.S. citizens) holding a Maine

For a more complete discussion of these concepts, see: Boyle, Kevin J., Vicki A. Trefts and Parnel Hesketh. 1988. "Economic Values for and Uses of Maine's Inland Fish and Wildlife Resources." Miscellaneous Publication 698, Maine Agricultural Experiment Station, University of Maine.

fishing license were not sampled.³ Juvenile anglers were not sampled due to concerns that they would be unable to complete the survey. Alien anglers were not sampled because of concerns about language and currency exchange rate problems affecting their ability to complete the survey. All other anglers who either purchased a license or held a complimentary license were eligible for selection in the sample. This sampling frame consisted of 204,393 licensed resident anglers and 89,214 licensed nonresident anglers.⁴

A total of 4,000 licensed anglers, 2,000 residents and 2,000 nonresidents, were sampled and mailed a survey designed to obtain information about their 1987 fishing effort within Maine. The response rates, as a percent of deliverable surveys, were 77 percent and 78 percent, respectively, for residents and nonresidents.

Selected Angler Characteristics

Angling and socioeconomic characteristics of respondents, broken down by resident and nonresident anglers, are presented in Table 1. It should be noted that not everyone who purchases a fishing license actually fishes. This occurs for a variety of reasons. For example, a person may purchase a combination

³ There were 214 licensed alien anglers and 6,017 licensed junior anglers in Maine during 1987, representing 2 percent of all licensed anglers in Maine.

⁴ These numbers represent The Department of Inland Fisheries and Wildlife's best estimates of the number of licensed anglers in Maine during 1987.

hunting and fishing license, and would be eligible for selection in either the angler sample or the hunter sample. If this individual only hunted and was selected in the angler sample, he/she would be recorded as not fishing in 1987. Or, someone may purchase a fishing license and not fish due to illness, time constraints, or numerous other reasons. In 1987, 83 percent of the residents who held a Maine fishing license actually fished in Maine, and the corresponding figure for nonresidents is 94 percent.

As one would expect, residents have fished in Maine 10 to 15 years longer than have nonresidents, and residents fish within Maine on a more regular basis. More than 60 percent of residents also hunted in Maine during 1987, while only 12 percent of the nonresidents hunted in Maine during 1987.

fable 1. Characteristics	s of	Maine	Licensed	Anglers	During	1987
--------------------------	------	-------	----------	---------	--------	------

Characteristic	Residents	Nonresidents
Actually Fished in Maine During 1987	83%	94%
First Fished in Maine	1960-1969	1975-1979
Frequency Fished in Maine	more than half of the years	about half of the years
Hunted in Maine During 1987	62%	12%
Trapped in Maine During 1987	3%	0%
Age	41	42
Male Anglers	81%	88%
Education	some training beyond high school	Associate Degree
Annual Household Income	\$29,400	\$47,300

The socioeconomic characteristics of resident and nonresident respondents are quite similar for all categories except one. The average household income of nonresidents is roughly \$18,000 greater than that of residents. One should be careful not to attach too much significance to this difference since it may reflect, for example, differences in wages and the cost of living between southern New England and Maine. That is, the relative standard of living may be the same for resident and nonresident anglers. Note that the levels of education are nearly the same.

Surplus Values for Selected Types of Sport Fishing

Surplus values per angler are reported for open water fishing (pond/lake and stream/river) and ice fishing in Table 2. Surplus values for sport fishing in Maine's tidal waters and coastal bays are not reported. This omission is due to the fact that a Maine fishing license is not required to fish these coastal waters. In turn, part of the first year of the study was spent developing a sample of marine sport anglers that represents both licensed inland anglers and other individuals who fish these waters but do not hold an inland fishing license. Results of the marine sport fishing survey will be reported at the end of the second year of the study. Please note, however, that expenditures for Maine fishing by individuals holding an inland fishing license are reported in the following section.

Fishing Type	Average Annual Surplus Value Per Angler
	Residents Nonresidents
Pond/Lake Fishing single day trips multiple day trips	\$149 \$68 \$163 \$155
Stream/River Fishing single day trips multiple day trips	\$ 99 \$ 50 \$102 \$121
Ice Fishing single day trips multiple day trips	\$ 87 \$ 37 \$120 \$ 71

Table 2. Surplus Values for Selected Types of Sport Fishing in Maine During 1987.

Surplus values are reported for both single day and multiple day trips. Separate surplus values were estimated for these two trip types because they represent very different recreational experiences and, at least part of the difference, should be reflected by surplus values. The relationship between single day and multiple day surplus values concur with our expectations. For any particular type of fishing or group of anglers, multiple day surplus values exceed those for single days. In addition, resident surplus values exceed comparable nonresident surplus values in all cases but one, multiple day trips for stream/river fishing.

What do these surplus values mean? Take pond/lake fishing as an example. An average resident would pay a maximum of \$149 per year in excess of total trip expenses, rather than forgo the opportunity to take single day, pond/lake fishing trips. Comparably, an average nonresident angler would pay a maximum of \$68 per year in excess of total trip expenses rather than forgo the opportunity to take single day, pond/lake fishing trips. All other factors being equal, the higher the average surplus value, the more desirable a fishing experience is to anglers. Open water surplus values exceed comparable ice fishing surplus values in general. For open water fishing, all pond/lake surplus values exceed comparable stream/river surplus values.

Before proceeding to economic impacts of sport fishing, it should be noted that the surplus values in Table 2 cannot be added to obtain aggregate surplus values for resident and

nonresident anglers. An angler might take a multiple day, pond/lake fishing trip, and also take several single day pond/lake fishing trips. Another angler may take only single day, pond/lake fishing trips. In other words, not all anglers take both single day and multiple day, pond/lake fishing trips. Thus, to add single day and multiple day surplus values for all anglers is not appropriate and sophisticated aggregation procedures must be employed to derive aggregate surplus values for resident and nonresident sport fishing. These aggregates will be reported at the end of this section on sport fishing.

Economic Impacts of Sport Fishing

Economic impacts per angler are reported for all types of sport angling combined (ice fishing, open water fishing and marine sport fishing). These expenditures are broken down into three categories. Trip specific expenditures are expenses that may be incurred each time an angler goes fishing (Table 3). Fishing equipment expenses for items purchased solely for fishing that can be reused on a number of fishing trips are reported in Table 4. Finally, equipment may be purchased to use for fishing and other purposes (Table 5). This last category of expenditures is adjusted by multiplying the expenditures by the percent of use dedicated to fishing. For example, an angler may purchase a boat for \$10,000 and use it 25 percent of the time for fishing. Accordingly, \$2,500 (\$10,000 x 0.25) would be reported.

Trip specific expenditures reveal an expected pattern (Table 3). Residents spend more on gasoline for personal

transportation, and bait, than do nonresidents. Although nonresidents may spend more per trip on gas, residents take a larger number of fishing trips in Maine each year. This also accounts for the differences in expenditures on bait. In contrast, nonresidents spend more than residents on commercial transportation, lodging and guide fees. Overall, resident anglers spent \$328 per person in Maine for all fishing trips during 1987 and nonresidents spent \$391 per person.

Item	Average Annual Expenditure Per Angler			
	Residents	Nonresidents		
Gasoline for Personal Transportation Commercial Transportation Food, Beverages, etc. Lodging Bait Boat Launch Fees Land Access Fees Guide Fees Equipment Rental Other Miscellaneous Expenditures	\$130 1 115 43 22 3 5 0 3 6	\$ 77 15 114 131 11 2 3 11 12 15		
Total 1987 Trip Specific Expenditures	\$328	\$391		

Table 3. Trip Specific Expenditures in Maine for all Fishing Trips During 1987

As expected, resident anglers spend more in Maine for fishing equipment than do nonresidents (Table 4). This result also holds for all individual categories of expenditures except for the purchase of a fishing license since most nonresident licenses cost more than resident licenses. Resident equipment expenditures in Maine totaled \$332 per angler in 1987 and nonresidents spent \$138 per angler in Maine. The expenditures reported in Table 4 are averages for all anglers, and do not, in general, equal the actual purchase price of the item. Many anglers may not purchase an item in any given year. Thus, these nonpurchases are included in the averages as zeros. This is also true for fishing licenses for which complimentary licenses are issued.

Item	Average Annu Per	al Expenditures Angler
	Residents	Nonresidents
Fishing License (Not Combination) Rods, Reels and Rod Holders Landing Nets Tackle and Tackle Boxes Waders Ice Fishing Equipment Bait Buckets and Minnow Traps Depth Finder, Fish Finder, etc. Down Rigger Boat (Cance) Motor Trailer	\$ 12 41 2 37 6 26 3 21 4	\$ 28 16 1 19 2 3 1 4 1
Accessories Used <u>Only</u> for Fishing Repair of Fishing Equipment Maps Clothing Used <u>Only</u> for Fishing Taxidermy and Mounting Other Miscellaneous Expenditures	151 9 5 8 3 4	46 2 3 6 2
Total 1987 Fishing Equipment Purchase	s \$332	\$ <u>1</u> 38

Table 4. Fishing Equipment Purchased in Maine During 1987

As with fishing equipment, resident expenditures on equipment used for fishing and other activities generally exceed nonresident expenditures for these items (Table 5). The only exception is recreational property where residents spent an average of \$220 per angler while nonresidents spent an average of \$277 per angler. This result may reflect, in part, the current demand by nonresidents for recreational property in Maine. Total fishing related equipment purchases made in Maine during 1987 by residents is \$968 per angler and, likewise, for nonresidents the total is \$464 per angler.

Table 5. Equipment Purchased in Maine During 1987 Used for Fishing and Other Activities

Item	Average Annu Per	al Expenditures Angler
	Residents	Nonresidents
Combination Fishing and Hunting License Boat (Canoe), Motor, Trailer and	\$ 9	\$ 4
Accessories ATV, Snowmobile, Utility Trailer Travel Trailer Comport Motor Home	145 86 95	28 · 10
Car, Truck, etc. Recreational Property	358 220	43 76 277
Camping Equipment (Tent, Sleeping Bag etc.)	1.8	7
Binoculars, Cameras, Film, etc. Equipment Repair	12	7 2
Insect Repellent Clothing Other Miscellaneous Expenditures	5 14 1	8
Total 1987 Purchases of Equipment Use for Fishing and Other Activities	- :d \$968	\$464
Boat (Canoe), Motor, Trailer and Accessories ATV, Snowmobile, Utility Trailer Travel Trailer, Camper, Motor Home Car, Truck, etc. Recreational Property Camping Equipment (Tent, Sleeping Bag etc.) Binoculars, Cameras, Film, etc. Equipment Repair Insect Repellent Clothing Other Miscellaneous Expenditures Total 1987 Purchases of Equipment Use for Fishing and <u>Other</u> Activities	145 86 95 358 220 4, 18 12 5 5 14 1 4 1	28 10 43 76 277 7 7 2 2 2 8 0 \$464

Unlike surplus values, the various expenditure categories can be added because there is no overlap in the accounting framework. When adding the totals for the three expenditure categories, resident anglers spent a total of \$1,628 per person (\$328 + \$332 + \$968) in Maine during 1987. The comparable figure for nonresident anglers is \$993 per person (\$391 + \$138 + \$464).

Aggregate Angler Surplus Values and Economic Impacts

As was previously reported, in 1987 a total of 204,393 licensed resident anglers and 89,214 licensed nonresident anglers were eligible for selection in the sample (juvenile and alien anglers were excluded). Recall, however, that only a percentage of all license holders actually fished in Maine during 1987. Therefore, the total number of anglers eligible for selection must be reduced to the number of active anglers in order to derive aggregate surplus values and economic impacts. Using the percentages reported in Table 1, 169,646 resident anglers (204,393 x 0.83) and 83,861 nonresident anglers (89,214 x 0.94) are used to calculate aggregate surplus values and economic impacts.

Calculation of aggregate surplus values is difficult because some anglers take both single day and multiple day trips, while others take only single day or multiple day trips. Let us take resident ice fishing as an example. It is first necessary to determine the percentage of resident anglers who actually ice fished (49 percent). Next we determine whether anglers who ice fished took single day or multiple day trips. These figures are 95 percent and 37 percent, respectively. Aggregate surplus values for resident ice fishing can now be calculated. The number of resident anglers who actually fished in 1987 (169,646) multiplied by the percentage who ice fished (0.49) yields the number of 1987 resident ice anglers, 83,127. The number of resident ice anglers multiplied by the percentage who took single

day trips (0.95) and multiplied again by the single day, ice fishing surplus value of \$87 yields an aggregate surplus value for resident, single day ice fishing trips of \$6.9 million. Using the same procedure, the multiple day aggregate surplus value for resident ice fishing is \$3.7 million. These numbers are added to obtain an aggregate surplus value for resident ice fishing in Maine during 1987 of \$10.6 million.

The overall aggregate surplus value for resident sport fishing in Maine during 1987 by licensed anglers is \$60.8 million (Table 6). The comparable nonresident overall aggregate surplus value is \$13.8 million. Adding these two numbers yields an aggregate surplus value for all inland sport fishing in Maine of \$74.6 million for 1987.

	Pagidant	Nonrogidont	
	Resident	Nonresident	TOLUTZ
Surplus Value	\$ 60.8	\$ 13.8	\$ 74.6
Economic Impact	¢110 0	t 1 1 1	<u>ተ156</u> ለ
Maximum	\$276.2	\$ 44.4 \$ 83.3	\$359.5
Total Economic Value			
Minimum	\$172.8	\$ 58.2	\$231.0
Maximum	\$337.0	\$ 97.1	\$434.1

Table 6. Aggregate Surplus Values, Economic Impacts and Total Economic Values for Fishing in Maine During 1987^a

^a All numbers are reported in millions of dollars (x\$1,000,000).

Two cautions are warranted when interpreting this aggregate figure. First, some survey respondents appear to have treated pond/lake fishing and stream/river fishing as one category. This problem could not be eliminated from the data and the effect is to overestimate the aggregate surplus value of inland fishing. On the other hand, surplus values were not estimated for marine sport fishing. Our assumption is that the omission of marine sport fishing has a stronger effect on aggregate surplus value than does the double counting of pond/lake and stream river fishing, and \$74.6 million is a minimum estimate of aggregate surplus value for all sport fishing in Maine during 1987.

Aggregate economic impacts are easier to derive than aggregate surplus values. Total expenditures for residents in 1987 were \$1,628, yielding an aggregate economic impact of \$276.2 million (\$1,628 x 169,646) (Table 6). The aggregate economic impact for nonresidents in Maine durling 1987 is \$83.3 million (\$993 x 83,861 . These figures can be added to obtain a total economic impact for sport fishing in Maine during 1987 of \$359.5 million.

As with aggregate surplus value, caution is warranted when interpreting the aggregate economic impact. First, economic impacts associated with marine sport fishing by anglers who do not hold an inland fishing license were not estimated. This would serve to underestimate economic impacts. Second, the appropriate question to ask regarding the items reported in Table 5 is whether the angler would have purchased the item if

he/she did not fish. If the answer is "yes," then the expenditure should not be counted as an economic impact associated with fishing. The purchase would have been made regardless of whether the person fished. Of course, if the answer is "no," then the expenditure, multiplied by the percentage of use dedicated to fishing, would be counted as an economic impact associated with sport fishing in Maine. This question, however, was not asked of anglers due to the complications of administering it in the survey. This effect is likely to be much stronger than the omission of marine sport anglers who do not hold an inland fishing license.

The aggregate economic impact of sport fishing, therefore, is likely to be overstated. A minimum aggregate economic impact is obtained by including only trip specific and fishing equipment purchases. This minimum estimate of the aggregate economic impact is \$156.4 million (\$660 x 169,646 + \$529 x 83,861).

Based on the minimum aggregate estimates of surplus value and the minimum and maximum estimates of aggregate economic impacts, it is possible to develop bounds for an aggregate total economic value of fishing in Maine. The estimated minimum total economic value for resident anglers will not be less than \$172.8 million (\$60.8 million plus \$112.4 million) and probably does not exceed a maximum of \$337 million (\$60.8 million plus \$276.2 million). For nonresident anglers, the comparable minimum and maximum estimates of aggregate total economic value, respectively, are \$58.2 million (\$13.8 million plus \$44.4

million) and \$97.1 million (\$13.8 million plus \$83.3 million). Overall, aggregate total economic value for all fishing in Maine during 1987, then, is no less than \$231 million (\$172.8 million plus \$58.2 million) and will not exceed \$434.1 million (\$337 million plus \$97.1 million).

HUNTING

The procedure used to select a sample of hunters is comparable to the selection of the angler sample. Licensed juvenile hunters and licensed alien hunters were not sampled, and all other individuals holding a 1987 Maine hunting license were eligible for selection in the sample.⁵ Thus, the sampling frame consisted of 176,382 licensed resident hunters and 36,422 licensed nonresident hunters.⁶

A total of 3,000 licensed hunters, 2,000 residents and 1,000 nonresidents, were sampled and mailed a survey designed to obtain information about their 1987 hunting effort within Maine. The response rates, as a percent of deliverable surveys, were 78 percent and 82 percent, respectively, for residents and nonresidents.

⁵ There were 2,039 licensed alien hunters and 15,374 licensed juvenile hunters in Maine during 1987, representing 8 percent of all licensed hunters in Maine.

⁶ These number represent the Department of Inland Fisheries and Wildlife's best estimates of the number of licensed hunters in Maine during 1987.

Selected Hunter Characteristics

Hunters are similar to anglers in the sense that not everyone who holds a hunting license actually hunts (Table 7). In 1987, 89 percent of the resident license holders hunted and 98 percent of the nonresident license holders hunted. These figures are slightly higher than the participation rates reported for resident and nonresident anglers.

Characteristic	Residents	Nonresidents
Actually Hunted in Maine During 1987	89%	98%
First Hunted in Maine	1960-1969	1975-1979
Frequency Hunted in Maine	more than half of the years	more than half of the years
Fished in Maine During 1987	85%	32%
Trapped in Maine During 1987	48	1%
Age	40	42
Male Hunters	93%	99%
Education	some training beyond high school	some training beyond high school
Annual Household Income	\$28,300	\$42,900

Table 7. Characteristics of Maine Licensed Hunters During 1987

As reported for licensed anglers, resident hunters have hunted in Maine 10 to 15 years longer than nonresidents. However, both residents and nonresidents hunted in Maine in more than half of the years. Most resident hunters (85 percent) fished in Maine during 1987, but only 32 percent of the

nonresident hunters fished in Maine during 1987.

The socioeconomic characteristics of resident and nonresident hunters are quite similar for all categories except one, as was found for resident and nonresident anglers. The average household income of nonresident hunters is roughly \$15,000 greater than that of resident hunters. As with resident and nonresident anglers, caution should be used when interpreting this difference in income levels. The education levels of resident and nonresident hunters are exactly the same.

Surplus Values for Selected Types of Hunting

Surplus values per hunter are reported for three species and three groups of species in Table 8. Noticeably missing from this table are surplus values for two big game species, moose and turkey. The moose and turkey surveys are being conducted in conjunction with the 1988 moose hunt and the 1989 turkey hunt. Thus, returns from the 1988 moose survey are currently being tabulated and the turkey survey will be conducted early in the summer of 1989. Final results of both of these surveys will be reported at the end of the second year of the study.

Hunting Type	Average Annua Per	l Surplus Value Hunter
	Residents	Nonresidents
Deer		
single day trips multiple day trips	\$ 90 \$ 91	\$108 \$154
Bear		· · · · *
multiple day trips	\$ 58 °C d	\$ 47 ° \$101
Rabbit		ىلە
single day trips multiple day trips	\$ 15 	\$ 44 ^ \$ 34 *
Grouse and Woodcock		
single day trips multiple day trips	\$ 31 \$ 28 *	\$86 \$97
Sea Duck ^a	JL.	
single day trips multiple day trips	\$ 76 *	
Migratory Waterfowl ^b	· · · · *	
single day trips multiple day trips	\$ 68	a a .

Table 8. Surplus Values for Selected Types of Hunting in Maine During 1987

^a Includes Eiders, Old Squaws and Scoters.

- ^b Includes inland and coastal ducks, and Canada Geese. Does not include Eiders, Old Squaws and Scoters.
- ^C An asterisk indicates a very small sample size so these estimates should be interpreted with caution.
- ^d A double dash indicates that the sample size was not sufficient to report an average surplus value.

You will note the difference in reporting of surplus values between those for anglers and those for hunters. Anglers typically fish a certain type of water and then can target a single species, or several species simultaneously, while fishing. Hunters, on the other hand, tend to target a species and they may incidentally hunt other species at the same time, e.g., grouse hunting while primarily deer hunting. Species such as Sea Ducks are grouped because all species within the group are generally hunted simultaneously. Thus, angler surplus values are reported by the type of water fished, while hunter surplus values are reported by type of species or group of species hunted.

The highest surplus values occur for deer hunting for both residents and nonresidents. Recall from the previous discussion of surplus values, all other factors being equal, the higher the surplus the value the more desirable the activity is to current and future participants. For residents, single day surplus values, in descending order, are deer (\$90), sea duck (\$76), migratory waterfowl (\$68), bear (\$58), grouse and woodcock (\$31), and rabbit (\$15) (Table 8). Note that very few multiple day surplus values are reported for residents hunters, and multiple day surplus values are about the same as comparable single day surplus values. This is due to the fact that resident hunters typically take one day hunting trips, with the exception being deer hunting. Multiple day surplus values are reported for grouse and woodcock also. This result appears to occur because of the interaction of deer hunting and grouse hunting. Suppose, for purposes of illustration, that two hunters take a four day deer hunting trip. Each hunter bags a deer on the first day of the hunt. For these two hunters, their deer hunting season is

over. However, they can spend the rest of their trip hunting grouse if they so choose.

For nonresidents, multiple day hunting trips are more likely than single day hunting trips and multiple day surplus values exceed single day surplus values in all cases except one (rabbit hunting). The largest surplus values for resident, multiple day trips are deer (\$154), bear (\$101), and grouse and woodcock (\$97). For single day trips the order of bear hunting (\$47) and grouse and woodcock hunting (\$86) is reversed.

As with angler surplus values, the hunter surplus values cannot be added to obtain aggregate surplus values for resident and nonresident hunters. Once again, participation rates for single day and multiple day trips must be considered in developing aggregate surplus values. These aggregates are reported at the end of this section on hunting.

Economic Impacts of Hunting

Economic impacts per hunter are reported by expenditure categories as was done for sport fishing. Specific types of expenditures differ within each category to represent unique hunting expenditures and to exclude expenditures that are unique to fishing.

Trip specific expenditures for hunting reveal a different pattern between residents and nonresidents than was reported for anglers. Nonresident expenditures exceed those of residents in all but two categories, bait and ammunition (Table 9). In fact, total nonresident expenditures in Maine for trip specific items (\$419) during 1987 are more than double total resident expenditures (\$198). For anglers, total nonresident expenditures on trip specific items only exceeded total resident purchases by \$63, or 18 percent.

Table 9. Trip Specific Expenditures in Maine for all Hunting Trips During 1987

Item	Average Annual Expenditur Per Hunter				
	Residents	Nonresidents			
Gasoline for Personal Transportation Commercial Transportation Food, Beverages, etc. Lodging Bait Ammunition Land Access Fees Guide Fees Equipment Rental Other Miscellaneous Expenditures	\$ 84 1 63 12 5 24 2 1 2 4	\$ 89 13 120 108 2 17 6 40 3 21			
Total 1987 Trip Specific Expenditures	\$198	\$419			

Total resident purchases of hunting equipment in Maine during 1987 (\$208) exceed nonresident expenditures (\$189) by \$19, or 10 percent (Table 10). However, resident angler equipment purchases were more than two times nonresident angler equipment purchases. Part of this difference may be explained when resident and nonresident expenditures on equipment are compared line by line. For anglers, resident expenditures exceed nonresident expenditures in all categories but one. For hunters, comparisons across items reveal that resident expenditures exceed nonresident expenditures for only 7 of the 13 line items, roughly 50 percent of the cases.

; Item	Average Annu Per	al Expenditures Hunter	
	Residents	Nonresidents	
Hunting License (Not Combination) Guns Telescopic Sights Bows and Arrows Equipment Holders (Gun Cases, Gun Racks, etc.) Decoys and Game Calls Repair of Hunting Equipment	\$ 12 84 15 17 9 3 4	\$ 66 30 7 4 5 1 1	
Maps Game Scouting Expenses Prior to Hunti Season Clothing Used <u>Only</u> for Hunting Taxidermy, Mounting and Tanning Meat Processing Other Miscellaneous Expenditures	ng 8 32 13 6 3	3 10 39 17 2 4	
Total 1987 Hunting Equipment Purchase	s \$208	\$189	

Table 10. Hunting Equipment Purchased in Maine During 1987

Hunter expenditures on equipment used for hunting and other activities also portray a different pattern of resident and nonresident expenditures than was reported for anglers. Total nonresident hunter purchases in Maine during 1987 (\$477) exceed total resident hunter purchases (\$469) by only \$8 (Table 11). Total resident angler expenditures for items used for fishing and other activities more than doubled nonresident expenditures. Interestingly, nonresident hunter expenditures on recreational property is \$277, the same amount reported for nonresident anglers.

	Average Annual Expenditure: Per Hunter		
Item	Residents	Nonresidents	
Combination Fishing and Hunting Licen Boat (Canoe), Motor, Trailer and	se \$ 12	\$ 1,5	
Accessories	3 9	ວັ	
ATV, Snowmobile, Utility Trailer	45	16	
Travel Trailer, Camper, Motor Home	22	10	
Car, Truck, etc.	223	120	
Recreational Property	79	277	
Camping Equipment (Tent, Sleeping Bag etc.)	9	6	
Binoculars, Spotting Scopes, Cameras,			
Film. etc.	1	· O	
Equipment Repair	5	2	
Insect Repellent	2	1	
clothing	17	18	
Hunting Dogs	12	46	
Other Miggellaneoug Evnerditures		1	
Other Miscellaneous Expenditures	4	4	
Total 1987 Purchase of Equipment Used for Hunting and <u>Other</u> Activities	\$469	\$477	

Table 11. Equipment Purchased in Maine During 1987 Used for Hunting and <u>Other</u> Activities

Aggregate economic impacts per nunter are computed by adding the column totals from Tables 9, 10, and 11. Resident hunters spent \$875 (\$198 + \$208 + \$469) in Maine during 1987, and the comparable figure for nonresident hunters is \$1,085 (\$419 + \$189 + \$477). Thus, resident hunters spent less per person in Maine during 1987 than did resident anglers (\$1,628), and nonresident hunters spent more per person in Maine during 1987 than did nonresident anglers (\$993).

Aggregate Hunter Surplus Values and Economic Impacts

There were 176,382 licensed resident hunters and 36,422 licensed nonresident hunters who were eligible for selection in

the sample (juvenile and alien hunters are excluded). These totals are reduced to the number of individuals actively hunting in Maine during 1987 using the percentages reported in Table 6. Totals of 156,980 resident hunters (176,382 x 0.89) and 35,694 nonresident hunters (36,422 x 0.98) are used to calculate aggregate surplus values and economic impacts.

The calculation of aggregate surplus values for hunting is done in a manner similar to that employed for fishing. The only difference is that surplus values for species and groups of species are aggregated rather than aggregating surplus values for fishing on various types of water. The aggregate surplus value for resident hunting is \$22.1 million (Table 12). The comparable aggregate surplus value for nonresident hunting in Maine is \$5.4 million. Adding these two aggregate surplus values yields an aggregate surplus value for all hunting in Maine of \$27.5 million in 1987.

Table	12.	Aggregate	Surplu	is Va	alues,	Econo	omic 1	Impacts	and	Total
		Economic '	Values	for	Huntin	g in	Maine	e During	j 198	37 ^a

	Resident	Nonresident	Totals
Surplus Value	\$ 22.1	\$ 5.4	\$ 27.5
Economic Impact Minimum Maximum	\$ 63.7 \$137.4	\$ 21.7 \$ 38.7	\$ 85.4 \$176.1
Total Economic Values Minimum Maximum	\$ 85.8 \$159.5	\$ 27.1 \$ 44.1	\$112.9 \$203.6

^a All numbers are reported in millions of dollars (x\$1,000,000).

This aggregate surplus value for all hunting in Maine should be interpreted as a minimum estimate. That is, the surplus values reported in Table 8 are not comprehensive. For example, surplus values were not reported for moose and turkey hunting. However, given the limited number of individuals participating in these hunts (maximums of 1,000 moose hunters and 500 turkey hunters), it is unlikely that the addition of surplus values for moose and turkey hunting will substantially change the aggregate surplus for hunting. Therefore, considering the sampling error in the study, the minimum estimate of \$27.5 is probably a reasonable estimate of the aggregate surplus value for hunting in Maine during 1987.

The aggregate economic impact of hunting in Maire during 1987 is \$137.4 million for residents (\$875 x 156,980) and \$38.7 million for nonresidents (\$1,085 x 35,694) (Table 12). The total economic impact for all hunting in Maine during 1987 is \$176.1 million (\$137.4 million plus \$38.7 million). This number is substantially less than the aggregate economic impact reported for sport fishing. This is primarily due to the lower expenditures of resident hunters relative to the expenditures of resident anglers and the small number of nonresident hunters relative to nonresident anglers.

As with sport fishing, this aggregate economic impact must be interpreted as a maximum estimate since expenditures on equipment used for hunting and other activities may be overstated. A minimum estimate is obtained by including only

trip specific and hunting equipment purchases. This minimum
estimate of the aggregate economic impact is \$85.4 million (\$406
x 156,980 + \$608 x 35,694).

The minimum aggregate total economic value of resident hunting is \$85.8 million (\$22.1 million plus \$63.7 million), and the corresponding maximum for resident hunters if \$159.5 million (\$22.1 million plus \$137.4 million). For nonresidents, the minimum and maximum aggregate total economic values, respectively, are \$27.1 million (\$5.4 million plus \$21.7 million) and \$44.1 million (\$5.4 million plus \$38.7 million). In turn, the minimum estimate of total economic value of hunting in Maine during 1987 is \$112.9 million (\$85.8 million plus \$27.1 million), and the maximum estimate is \$203.6 million (\$159.5 million plus \$44.1 million). Aggregate surplus value is added to the aggregate economic impact to obtain these figures.

TRAPPING

The sample of trappers was randomly selected from a subset of all individuals holding a 1987 Maine trapping license. As was done for fishing and hunting, juveniles and aliens were excluded from the sampling frame.⁷ In addition, native Americans holding a combination hunting, fishing and trapping license were not

There were 25 licensed alien trappers and 459 licensed junior trappers in Maine during 1987, representing 7 percent of all licensed trappers in Maine.

included in the sampling framework.⁸ This omission is not a problem because none of these native Americans tagged a fur bearer in Maine during 1987, which indicates that they probably used their licenses only for hunting and/or fishing. All other individuals who either purchased a trapping license or meld a complimentary trapping license were eligible for selection in the sample, a total of 4,767 licensed trappers. This total includes only Maine residents.

A total of 200 trappers was sampled and mailed a survey designed to obtain information about their 1987/88 trapping effort (July 1, 1987, through June 30, 1988). The response rate, as a percent of deliverable surveys, was 88 percent.

Selected Trapper Characteristics

Trapping and socioeconomic characteristics of trappers responding to the survey are reported in Table 13. Note that these characteristics are reported only for Maine residents since the sample did not include nonresidents. As with anglers and hunters, only a percentage of licensed trappers actually trapped during the 1987/88 trapping seasons. Seventy-six percent of individuals licensed to trap in Maine during 1987/88 actually set traps in the state. This figure is lower than the participation rates reported for resident anglers and hunters.

8

A total of 1,676 native Americans held a Maine combination hunting, fishing and trapping license during 1987.

Table	13.	Characteristics	of	Maine	Licensed	Trappers	During	1987
-------	-----	-----------------	----	-------	----------	----------	--------	------

Characteristic	All Trappers
Actually Trapped in Maine During 1987	76%
First Trapped in Maine	1970-1974
Frequency Trapped in Maine	more than half of the years
Hunted in Maine During 1987	95%
Fished in Maine During 1987	92%
Age	44
Male Trappers	99%
Education	High School Graduate
Annual Household Income	\$23,700

The average trapper first set traps between 1970 and 1974, and has trapped in Maine in more than half of the years since that time. Nearly all trappers also hunt and fish in Maine. This result contrasts with overlaps in participation reported for anglers and hunters who also hunt or fish, but seldom trap.

The average age of trappers is 44, which is only slightly older than the average ages reported for resident anglers and hunters. Ninety-nine percent of the trappers are male. The average trapper has a high school education and an annual household income of \$23,700. These education and income figures are somewhat lower than those reported for resident anglers and hunters. Surplus Values for Trapping

As stated earlier in the report, surplus values were not estimated for trapping due to the mixture of commercial and recreational trapping that occurs in Maine. That is, 23 percent of the respondents said that they trapped to make money and 37 percent reported trapping income that exceeded their expenditures in 1987. These numbers indicate that some of Maine's trappers probably do trap commercially. Simple statistics, like those reported above, provide a starting point for determining whether a person is a commercial or recreational trapper, but more sophisticated analyses are required to classify trappers as being either recreational or commercial. Once trappers are classified, separate procedures must be employed to measure surplus values for each group. Due to these complications, we are unable to report a surplus value for trapping at this time.

Economic Impacts of Trapping

Economic impacts per trapper are reported for the same three expenditure categories that were discussed for fishing and hunting. However, the components within each category are somewhat different so that unique aspects of trapping will be represented, and purchases unique to fishing and hunting are excluded.

Total trip specific expenditures in Maine during 1987 for items purchased each time a trapper sets, checks or removes traps total \$187 per trapper (Table 14). The largest expenditure was for gasoline. Note that the average trapper does spend some

Item	Average Annual Expenditures Per Trapper
Gasoline for Personal Transportation Food, Beverages, etc. Lodging Baits, Scents, Lures Dye, Wax, Hulls, Antifreeze Land Access Fees Helper Fees Equipment and Airplane Rental Other Miscellaneous Expenses	\$ 83 29 3 25 10 3 17 7 10
Total Trip Specific Expenditures	\$187

Table 14. Trip Specific Expenditures in Maine for all Trapping During 1987

money to have someone else help set, check and remove traps.

Annual trapping equipment purchases totaled \$207 per trapper in 1987/88 (Table 15). The list of trapping equipment is more extensive than the list of fishing equipment (Table 4) and hunting equipment (Table 10) due to the specialized equipment required for trapping. Not surprisingly, the largest expenditures were made for traps, chains, drags and stakes. Table 15. Trapping Equipment Purchased in Maine During 1987

Item	Average Annual Expenditures Per Trapper
Trapping License and Tagging Fees	\$ 33
Traps, Chains, Drags, Stakes	48
Wire, Nails, etc.	5
Shovels, Axes, Saws, etc.	12
Ice Auger	6
Knives, Gambrels, Stretchers, etc.	6
Packs, Waders, Snowshoes	17
Boat, Motor, Trailer, Accessories	
Used <u>Only</u> for Trapping	10
ATV, Snowmobile, Utility Trailer Used	1
<u>Only</u> for Trapping	33
Repair of Trapping Equipment	5
Maps	<u>1</u>
Taxidermy, Tanning and Mounting	9
Clothing Used Only for Trapping	2
Membership Dues	+ <u>+</u>
Instruction Books, Videos	3
Miscellaneous Other Expenses	3
Total 1987 Trapping Equipment Purchases	\$207

Finally, purchases of equipment used for trapping and other activities are reported in Table 16. The total annual expenditure per trapper is \$489. The largest expenditures were made on vehicles for which at least a portion of the use is dedicated to setting, checking and removing traps.

Item	Average Annual Expenditures Per Trapper
<pre>Boat (Canoe), Motor, Trailer and Accessories ATV, Snowmobile, Utility Trailer. Travel Trailer, Camper, Motor Home Car, Truck, etc. Recreational Property Camping Equipment (Tent, Sleeping Bag, etc.) Binoculars, Camera, Film, etc. Pack, Waders, Snowshoes Shovel, Ax, Saws, etc. Ice Auger Knives, Gambrels, Stretchers, etc. Equipment Repair Clothing Other Miscellaneous Expenses</pre>	\$ 45 148 1 207 18 1 14 9 6 2 5 14 14 14 5
Total 1987 Purchases of Equipment Used for Trapping and <u>Other</u> Activities	\$489

Table 16. Equipment Purchased in Maine During 1987 Used for Trapping and Other Activities

Aggregate Trapping Economic Impacts

Following the same procedure used for fishing and hunting, the number of licensed trappers must be reduced to those who actually trapped during the 1987/88 trapping seasons. Using the percentage reported in Table 13, the number of individuals actively trapping during 1987/88 was 3,623 (4,767 x 0.76).

The aggregate economic impact of trapping must be interpreted with caution. The same caution that applied to the aggregate economic impacts for fishing and hunting must be considered. Expenditures on equipment used for trapping and other activities may be overstated. The minimum estimate of total expenditures per trapper during 1987 is \$394 (\$187 + \$207) and the maximum estimate is \$883 (\$187 + \$207 + \$489). A minimum estimate of the aggregate economic impact of trapping in Maine during 1987, therefore, is \$1.4 million (\$394 x 3,623). The maximum estimate is \$3.2 million (\$883 x 3,623).

AGGREGATE SURPLUS VALUES AND ECONOMIC IMPACTS FOR FISHING, HUNTING AND TRAPPING COMBINED

Aggregate surplus values and economic impacts for all consumptive uses of fish and wildlife resources in Maine are relatively easy to obtain using the information presented in the previous sections. The aggregate figures reported for fishing, hunting and trapping are simply added (See Table 17).

Table 17. Aggregate Surplus Values, Economic Impacts and Total Economic Values for all Consumptive Uses of Maine's Fish and Wildlife Resources During 1987^a

User Group	Aggregate Surplus Value	Aggregate Economic Impact	Aggregate Total Economic Value
Residents			
minimum	\$ 82.9	\$177.1	\$260.0
maximum	\$ 82.9	\$416.8	\$499.7
Nonresidents			
minimum	\$ 19.2	\$ 66.1	\$ 85.3
maximum	\$ 19.2	\$122.0	\$141.2
All Consumptive Users			·
minimum	\$ 102.1	\$243.2	\$345.3
maximum	\$ 102.1	\$538.8	\$640.9

a All numbers are reported in millions of dollars (x \$1,000,000).

The aggregate surplus value for resident fishing and hunting in Maine during 1987 is \$82.9 million (\$60.8 million plus \$22.1 million). The comparable figure for nonresident fishing and hunting is \$19.2 million (\$13.8 million plus \$5.4 million). Overall, the aggregate surplus value for all fishing and hunting in Maine during 1987 is \$102.1 million (\$82.9 million plus \$19.2 million). Recall that this is a minimum estimate, and surplus values were not estimated for trapping.

Minimum estimates of the aggregate economic impacts are also obtained in a straightforward manner. As previously computed, these estimates include only trip specific and activity specific expenditures. The minimum aggregate economic impact of resident fishing, hunting and trapping combined is \$177.1 million (\$112 million plus \$63.7 million plus \$1.4 million). Likewise, the minimum economic impact of nonresident fishing and hunting is \$66.1 million (\$44.4 million plus \$21.7 million). The overall minimum estimate of the aggregate economic impact of fishing, hunting and trapping is \$243.2 million (\$177.1 million plus \$66.1 million).

The maximum estimate of the combined aggregate economic impact of fishing, hunting and trapping is computed by adding the aggregates for the third set of expenditure categories for each activity to the minimum aggregate economic impact estimates reported in the preceeding paragraph. The maximum aggregate economic impact for resident fishing, hunting and trapping in Maine during 1987 is \$416.8 million (\$276.2 million plus \$137.4

million pllus \$3.2 million), and the corresponding figure for nonresidents is \$122 million (\$83.3 million plus \$38.7 million). The maximum estimate of the aggregate economic impact of all fishing, hunting and/or trapping in Maine during 1987 is \$538.8 million (\$416.8 million plus \$122 million).

As was done for each activity, aggregate surplus value and aggregate economic impacts can be added to obtain miminum and maximum estimates of aggregate total economic value for all consumptive uses of Maine's fish and wildlife resources. For residents, the minimum estimate of aggregate total economic value of resident fishing, hunting and trapping in Maine during 1987 is \$260 million (\$82.9 million plus \$177.1 million), and the maximum estimate is \$499.7 million (\$82.9 million plus \$416.8 million). The minimum aggregate total economic value of nonresident fishing and hunting in Maine during 1987 is \$85.3 million (\$19.2 million plus \$66.1 million), and the corresponding maximum aggregate total economic value for nonresidents is \$141.2 million (\$19.2 million plus \$122 million). The minimum estimate of aggregate total economic value for all consumptive uses is \$345.3 million (\$260 million plus \$85.3 million), and the maximum estimate is \$640.9 million (\$499.7 million plus \$141.2 million).

In closing we would like to acknowledge that the aggregate surplus values, aggregate economic impacts and aggregate total economic values reported above are very large numbers. Given this fact, we would like to offer a few words of caution when interpreting these numbers.

- 1. The surplus values are minimum estimates since surplus values are not estimated for marine sport fishing, moose and turkey hunting, and trapping.
- 2. The minimum aggregate economic impact is a reasonable estimate of the minimum. However, we believe that the maximum estimate of aggregate economic impact is probably an overstatement of the true economic impact. Therefore, extreme caution should be used when using this maximum estimate.
- 3. Given what we said for (1) and (2) above, the minimum estimate of total economic value for consumptive uses of Maine's fish and wildlife resources should exceed the minimum estimate of \$345.3 million, but will not exceed the maximum estimate of \$640.9 million.
- .4. Economic values and economic impacts for nonconsumptive uses of Maine's fish and wildlife resources are not reported. These numbers will be reported at the end of the second year of the study.
- 5. Economic multipliers are often applied to expenditure data to account for the effect of money being respent in an economy. The expenditures reported here are direct economic impacts and do not include multiplier calculations to account for the respending effect. If multipliers are applied to our numbers, they should only be applied to the economic impacts and not to the surplus values.